**Armatha Jordan’s Final Paper**

**Adapted** from -Sory Rodriguez

Persuassive letter rubric adapted from -www.learnnc.org/lp/media/lessons/.../**Persuasive**\_**Letter**\_**Rubric**.doc

Water, Energy, and Waste: Integrating Themes of Sustainability into Your Classroom

**Science Lesson Plan**

**Title:** Water Pollution Effects on Plants

**Subject/Topic:** Science/Water Pollution

**Grade Level:** Fourth

**Time/Duration:** 5 days

**Goals:**

The purpose of this lesson is to introduce students to the topic of water pollution and how this affects plants’ development and the environment the plants inhabit. In addition, this lesson will prompt students to make responsible decisions to conserve water and contribute to a more sustainable world.

**Objectives:**

Students will be able to:

* Use their background knowledge to make predictions about the effects of adding liquids with chemicals, solutions, etc. to plants. ***(Comprehension, Knowledge, Application, Evaluate)***
* Observe plants for a period of time to make comparisons and collect data. ***(Analysis, Synthesis****)*
* Have group discussions related to water pollution and the environment to understand sustainability. ***(Comprehension****)*
* Explain the data collected during observation supported by facts previously learned. ***(Evaluation, Synthesis)***
* Explain what water pollution is and the effects it has on plants. *(****Comprehension, Evaluation****)*
* understand the importance of sustainability and how they can support the environment by finding sustainable solutions such as water conservation.

**Standards Addressed:**

***Science: Scope and Sequence***

**STANDARD 1- Analysis, Inquiry, & Design:**

*Key Idea 1: The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process.*

* S1.3 Develop relationships among observations to construct descriptions of objects and events and to form their own tentative explanations of what they have observed.
* S1.3a Clearly express a tentative explanation or description which can be tested

*Key Idea 3: The observations made while testing proposed explanations, when analyzed using conventional and invented methods, provide new insights into phenomena.*

* S3.1 Organize observations and measurements of objects and events through classification-

and the preparation of simple charts and tables.

* S3.2 Interpret organized observations and measurements, recognizing simple patterns,

sequences, and relationships.

* S3.2a State, orally and in writing, any inferences or generalizations indicated by

the data collected

**STANDARD 7 - Connections**

*Key Idea 1:* The knowledge and skills of mathematics, science, and technology are used together to make informed decisions and solve problems, especially those relating to issues of science/technology/society, consumer decision-making, design, and inquiry into

phenomena.

•analyze science/technology/society problems and issues that affect their home, school,

or community, and carry out a remedial course of action

•make informed consumer decisions by applying knowledge about the attributes of

particular products and making cost/benefit trade-offs to arrive at an optimal choice

•design solutions to problems involving a familiar and real context, investigate

related science concepts to determine the solution, and use mathematics to model, quantify, measure, and compute

•observe phenomena and evaluate them scientifically and mathematically by con

**Charlotte Danielson’s Framework for Teaching:**

Domain 3: Instruction-

* Competency 3b-Using Questioning and Discussion Techniques
* Competency 3c- Engaging Students in Learning
* Competency 3d- Using Assessment in Instruction

**Prior Knowledge:**

For students to do this lesson they need to be able to:

* Identify the basic needs of plants such as air, water, and light.
* Explain and understand how living things grow and change.
* Observe and compare the parts of a plant that enables it to live and grow.
* Understand that changes in the environment affect plants in different ways (e.g., seasonal changes.)
* Explain some of the properties of liquids, gases and solids.
* Understand that water is essential for the survival of many organism
* Understand the water cycle

**Materials:**

\**Teacher should prepare materials ahead of time.*

* 1 clear cup per group and 1 for teacher
* Black watercolor paint
* 1 spoon per group and one for teacher (to mix the solutions/chemicals with the clean water)
* Labels (to identify the liquids)
* 1 gallon of water
* Chart paper and markers (for teacher)
* Crayons, coloring pencils, pencils
* Student worksheets (one per student)
* 1 grown plant per student (peas, beans, cucumbers, etc.) It is suggested for students to grow these plants prior to this lesson, so they can have their own plant.
* 1 small vial per student. (They will use it to add the liquid to the plants.)
* Different liquids to add to the plants. **Each group will get one liquid** to add to the plant. For example, cooking oil, water color paint, food coloring, dish soap, vinegar, laundry detergent, sugar. Place these liquids in bottles or vials for students to take from.
* Pictures showing pollution
* Basins (one per group)
* Assessment sheet/Conference notes
* Several small bottles to place the different liquids. (Prepare ahead of time).
* Napkins or cloth rags to clean

**Getting Ready for the lesson:**

* Gather all materials.
* Make sure there is a plant for each student and one for the teacher.
* For the beginning of the lesson, you need a clear cup of water and black paint to mix them.
* Write the steps of the investigation in a big chart paper or make copies for students.
* Make copies of the students’ worksheet.

**Lesson Procedure:**

**Introduction/Motivation:**

Teacher calls students to the rug and review the water cycle , the importance and many uses of water in our eco-sysytem. Then, he/she takes a plant and places it in a place where all students can see it.

*“What a beautiful plan, as we all know plants need water to survive. Oh! I have this cup of water. I am going to use it to water my plant.”*

The teacher takes the cup of clean water, adds black paint to it and mixes it with a spoon to make the water black. Then, the teacher puts the black water into the plant and wait for the students’ reactions. Students will react to this in different ways. This is a great opportunity to start a conversation about why the teacher is putting dirty/black water into the plant. Teacher listens to their comments and asks them questions such as:

* What happened? Why are you so upset/surprised/worry about me putting black water into the plant?
* Why I should not put black paint/water in the plant?
* Does it make a difference if I put clean water or dirty water? Yes/No. Why? Talk to your partners and discuss this .
* What do you think can happen to this plant? How do you know?

**Main Activity/Procedures-**

Teacher will tell students that they will be learning about water pollution by doing an investigation using plants.

*“Scientists! All your comments and concerns are very important and this is why today, we are going to start an investigation to learn about water pollution. An investigation/experiment is when you check something to find out what happens. Who knows what water pollution is?”*

Teacher listens to their comments and explains what water pollution is and shows them pictures. Teacher can make a chart to write students comments.

*“Water pollution is when we make water dirty.( Ask students if they know any ways in which our water is polluted? After a few responses discuss a few example from the pictures) Just like the water I put in my plant. Look at these pictures. They show water pollution…”*

*“Now that you know what water pollution is, you are ready to start your investigation. You will be detectives and your job will be to check your plants for a few days to see what happen to them when you add one of these liquids I have here*.”

Teacher points to the different liquids and tells students what they are. These liquids should be labeled in bottles or in the vials students are going to be using.

*“To do your investigation you will be working in groups, taking notes, measuring the plants and observing what happen to the plants when we add things into the soil. These are the steps you need to follow.*

***Steps to investigate water pollution effects in plants:***

1. *Make sure your plant has your name in it.*
2. *Fill your vial with the liquid assigned to your group.*
3. *Add the liquid to your plant.*
4. *Complete the information in your worksheet.*

*Watch me, as I show you how to do this.”*

Teacher models how to follow these steps and how to measure the plants and put the liquids in the plants in a safe way. Then, he/she will make a prediction.

*“After adding black paint to my plant, I predict that it will continue growing. What do you think will happen to your plants? Turn and tell your partners.”*

Then, students will turn and tell their partners what they think/predict that will happen to their plants if they add any of those liquids and discuss it with the class.

“*Now you are going to go back to your tables with your groups and together you will add the liquids in your plants. Make sure that you take notes, measure your plants and observe what happens when you add these liquids into your plants. When you are done, I will call you to the meeting area to discuss your findings and predictions.”*

While students are working, the teacher can ask the following questions to check for students’ understanding and to try to understand their thinking and how they are making connections with what they learned before:

* What predictions can you make about your plant(s)?
* Do you think they will continue growing? Why do you think that?
* How do you know you are taking good notes about your plants?
* Did you follow the steps? Can you explain what are you doing now?
* Is your water polluted? How do you know?
* Did you see any changes in the plant or soil? Yes/No. What changes, if any?

Once students are done adding liquids in the plants, the teacher will remind them to complete their worksheets with the information being asked.

**Recommendations:**

* Teacher should tell students not to drown the plants. Students should use vials to add liquids to the plants. As learned in previous lessons, students should know that if they add a lot of liquid the plants will die. It is recommended for them to add **one vial full** of the assigned liquid per plant for the investigation to be successful.
* It is recommended for each student to have a plant labeled with their names. If not, the groups can work with the plants provided by the teacher.
* Example of groups

Group 1: Food coloring

Group 2: Cooking oil

Group 3: Vinegar

Group 4: Watercolor paint

Group 5: Dish soap

Group 6: Water

**Differentiated Instruction-**

These differentiated activities are to help students make connections and use their prior knowledge providing additional experience or support for them to understand the concept being taught during the lesson.

* Teacher can decide how many liquids (solutions/chemical) each group will use. Thus, depending on the class, students can work in groups of two and use two or more chemicals/solutions instead of one.
* Teacher can take pictures of the plants before, during and after the experiment to compare results. Pictures can be placed in a chart or where students can see them and use them as reference to keep track of their findings.
* To provide language support for ELLs, students can write the vocabulary words with their meaning and make pictures to show the words.
* To support different learning styles, students with disabilities and ELLs: sing songs/music related to the topic, read poems about water pollution, do Total Physical Response (TPR) activities, read interactive stories/books that will benefit your students.
* Students can choose their groups. This will allow them to feel ownership and might get engaged in the activity a lot more.
* Students can use their Science journal to keep extra notes about the investigation.

**Conclusion-**

Students will gather on the rug area. The teacher will call on some students to share their work and findings and to explain their experiences, notes, and predictions from this investigation. To provide feedback, the teacher can comment on the work of some students and how their predictions can be similar or different depending on the liquids they are adding to their particular plants.

At the end of the lesson, students should understand what water pollution is and that this investigation will help them to see and experience how this can be harmful to plants and the environment as well.

To conclude the lesson, the teacher can review what was learned by asking students,

* What did you learn today?
* Is water pollution something to be worry about? Why or why not?
* **Is there anything you can do about it? ( A short read aloud of a power point presentation can be shown to the students about ways to stop/minimize water pollution) Teacher can say- You all came up with some really good ideas about ways to stop water pollution. We are going to look at a short presentation of many ways that people are stopping water pollution and the reasons why. You will find that some of your responses are presented and you will also see some new ideas. As you are looking at the presentation. I want you to look out for one solution that we as a class came up with and one solution that is new to you. You will use your knowledge over our journey to learn ways to stop water pollution to write a local congress person and convince he/she that this is important and something should be done.**

**Extension-**

***Math-*** This lesson can be extended to activities in Math where students can chart the growth of their plants after adding the different liquids.

S***ocial Studies***- This lesson is great for students to make connections between water pollution and how it affects other geographical areas in their communities and in the world. For example, they can learn how water pollution affects rivers, oceans, canals, and land. Also, they can learn how people adapt and make changes to the environment.

***Science***- Students can continue learning about water pollution and conservation in addition to other types of pollution in the air and land. Also, how they can learn how pollution affects not only plants, but animals and other living things on Earth as well.

***Art-*** A variety of art projects and presentations can be done with the topic of water pollution. Students can create a short drama or presentation to discuss water pollution and conservation. They can make posters and other art crafts using recycling materials.

***Assesments-Formal***

***Writing-*** Students will write persuasive letters to community leaders to make a change in their community in terms of water pollution.

**Informal** - To assess the students, I will confer with them and take specific notes about each child. I will pay attention to their performance, contributions, communication skills, representation and how they make connections by observing and listening to their ideas and looking at their work in groups and as individuals.

I will use questions such as the ones listed below to check their understanding of the concept learned. For example:

* How are the students working together?
* Is the student having discussions and communicating his/her ideas clearly?
* Is the student following the steps and writing information in his/her worksheets? Individually?
* Is the student drawing pictures, graphs, or using any other math strategy to show his/her work?
* Is the student able to understand and make connections with the concept learned?
* Can he/she work in a group and use the materials efficiently?

**Additional resources:**

Pollution Video 1- For Kids- Pollution: Meaning and Definition

<http://www.youtube.com/watch?v=aXmfQLC8ju4>

Rubric for Persuasive letter.

**Persuasive Letter Rubric**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **4** | **3** | **2** | **1** |
| **Opening Statement** | Strongly and clearly states a personal opinion. Clearly identifies the issue. | Clearly states a personal opinion. Some references to the issue. | Personal opinion is not clearly stated. Little or no references to the issue. | Personal opinion is not easily understood with no reference to the issue. |
| **Supporting Details** | Provides 2 or more strong details, reasons and/or examples in support of the opinion | Provides 2 details, reasons and/or examples in support of the opinion. | Provides at least 1 detail, reason and/or example in support of the opinion. | Provides little or no  support of the opinion. |
| **Tone/ Language** | Chooses words that are clear, descriptive and accurate. Maintains consistent persuasive tone throughout letter. | Adequately chooses words that are clear and descriptive. Demonstrates a persuasive tone in parts of the letter. | Chooses some words that are clear and descriptive. Lacks consistent persuasive  tone. | Language and tone of letter is unclear and lacks description. |
| **Format/ Organization** | Sentences and paragraphs are complete, well written and varied. | Sentence and paragraph structure is generally correct. | Sentence and paragraph structure is inconsistent | Little or no evidence of sentence or paragraph structure. |
| **Concluding Statement** | Summarizes personal opinion in a strong concluding statement. | Summarizes personal opinion in a concluding statement. | Concluding statement is a weak summary of personal opinion. | Concluding statement makes no reference to personal opinion. |
| **Mechanics and  Grammar** | Contains few, if any punctuation, spelling or grammatical errors. | Contains several errors in punctuation, spelling or grammar that do not interfere with meaning. | Contains many punctuation, spelling and/or grammatical errors that interfere with meaning | Contains many punctuation, spelling and/or grammatical errors that make the piece illegible. |